The United States has ratified this STANAG and it is approved for use. Actual promulgation by NATO is expected within one year. At that time, this document will be replaced by the promulgated version. Any U.S. comments or reservations are included in the following letter.

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ACQUISITION AND
TECHNOLOGY

June 10, 2002

MEMORANDUM FOR U.S. MISSION TO NATO, ARMAMENTS COOPERATION DIVISION
(ARMY ARMAMENTS OFFICER), PSC 81, APO AE 09724

SUBJECT: Draft STANAG 4240 (EDITION 2) – "LIQUID FUEL / EXTERNAL FIRE, MUNITION TEST PROCEDURE "

Reference document, AC/310-D/193, 12 December 2001, SAB.

The U.S. Armed Forces ratifies the referenced agreement.

Ratification and implementation details are as follows:

	IMPLEMENTATION					
	Forecast Date			Actual Date		
RATIFICATION REFERENCE	NAVY	ARMY	AIR FORCE	NAVY	ARMY	AIR FORCE
Memo, OUSD(A&T) DATED AS ABOVE	June 10, 2002			June 10, 2002		

NATIONAL IMPLEMENTING DOCUMENT: MIL-STD-2105C

RESERVATIONS: None

COMMENTS: None

The point of contact is Mr. James E. Elliott, DSN 880-3047, commercial (973) 724-3047.

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U.S. Key Delegate
AC/310 Main Group

CF:

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NORTH ATLANTIC COUNCIL
CONSEIL DE L'ATLANTIQUE NORD

NATO/PfP UNCLASSIFIED

12 December 2001

DOCUMENT
AC/310-D/193

**GROUP ON SAFETY AND SUITABILITY FOR SERVICE (S3)
OF MUNITIONS AND EXPLOSIVES (AC/310)**

CNAD PARTNERSHIP GROUP (CPG)

RATIFICATION DRAFT 1 - STANAG 4240 (EDITION 2) LIQUID FUEL / EXTERNAL FIRE, MUNITION TEST PROCEDURES

Memorandum by the Assistant Secretary General for Defence Support

(RATIFICATION REQUEST)

Reference: PfP(CPG-S/3-SG/3)DS/8 dated 30 November 2001

1. The Group on Safety and Suitability for Service of Munitions and Explosives, Sub-Group 3, approved, at reference, draft STANAG 4240 (Edition 2) for issue for ratification.

2. In line with the decision of the Group, the agreed text is herewith forwarded to delegations of NATO nations who are requested to obtain the national ratification by 15 June 2002. The delegations are asked to inform the Defence Support Division of their national Ratification references, together with a statement of the date by which national implementation is intended to be effective, using the ratification response form at Annex. The service or services within which the standard applies should be indicated.

3. Most national Ministries of Defence contain a standardization office or standardization liaison officer who can give advice on the procedure to be adopted to obtain a formal ratification reference. It is recommended that contact be made with that office.

4. As soon as sufficient ratifications have been received, this STANAG will be forwarded for promulgation.

(Signed) R. G. BELL

Enclosure: 1 Annex
Stanag 4240 (Edition 2)

Action Officer: R. Sladden
Original: English
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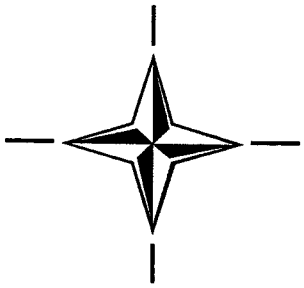
(Ratification Draft 1)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)



NATO STANDARDIZATION AGENCY
(NSA)

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: LIQUID FUEL / EXTERNAL FIRE, MUNITION TEST PROCEDURES

Promulgated on 2001

Jan H ERIKSEN
Rear Admiral, NONA
Director, NSA

Enclosure to
AC/310-D/198

STANAG 4240
(Edition 2)
(Ratification Draft 1)

RECORD OF AMENDMENTS

No.	Reference/date of amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Director, NSA under the authority vested in him by the NATO Military Committee.

2. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

DEFINITIONS

4. Ratification is "In NATO Standardization, the fulfilment by which a member nation formally accepts, with or without reservation, the content of a Standardization Agreement" (AAP-6).

5. Implementation is "In NATO Standardization, the fulfilment by a member nation of its obligations as specified in a Standardization Agreement" (AAP-6).

6. Reservation is "In NATO Standardization, the stated qualification by a member nation that describes the part of a Standardization Agreement that it will not implement or will implement only with limitations" (AAP-6).

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

7. Page (iii) gives the details of ratification and implementation of this agreement. If no details are shown it signifies that the nation has not yet notified the tasking authority of its intentions. Page (iv) (and subsequent) gives details of reservations and proprietary rights that have been stated.

FEEDBACK

8. Any comments concerning this publication should be directed to NATO/NSA - Bvd Leopold III, 1110 Brussels - BE.

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(Ratification draft 1)

RATIFICATION AND IMPLEMENTATION DETAILS
STADE DE RATIFICATION ET DE MISE EN APPLICATION

NATION / PAYS	NATIONAL RATIFICATION REFERENCE REFERENCE DE LA RATIFICATION NATIONALE	NATIONAL IMPLEMENTING DOCUMENT DOCUMENT NATIONAL DE MISE EN APPLICATION	IMPLEMENTATION/MISE EN APPLICATION					
			INTENDED DATE OF IMPLEMENTATION DATE ENVISAGEE DE MISE EN APPLICATION			DATE IMPLEMENTATION WAS ACHIEVED DATE EFFECTIVE DE MISE EN APPLICATION		
			NAVY MER	ARMY TERRE	AIR	NAVY MER	ARMY TERRE	AIR
BE								
CA								
CZ								
DA								
FR								
GE								
GR								
HU								
IT								
LU								
NL								
NO								
PL								
PO								
SP								
TU								
UK								
US								

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RESERVATIONS/RESERVES

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NAVY/ARMY/AIR

NATO STANDARDIZATION AGREEMENT (STANAG)

LIQUID FUEL / EXTERNAL FIRE, MUNITION TEST PROCEDURES

Annexes:

A. Specification for Standard Liquid Fuel /External Fire Test.
B. Specification For a Mini Fuel Fire (MFF) Test.

Related Documents:

AOP-38	Glossary of Terms and Definitions Concerning the Safety and the Suitability for Service of Munitions, Explosives, and Related Products.
AOP-39	Guidance on the Development, Assessment and Testing of Insensitive Munitions.
STANAG 4123	Methods to Determine and Classify the Hazards of Ammunition
STANAG 4439	Policy for Introduction, Assessment and Testing for Insensitive Munitions.
United Nations Document (UN) ST/SG/AC.10/11/ Rev 3/R.256	Recommendation on the Transport of Dangerous Goods Manual of Tests and Criteria (UN test 6c and 7g).

AIMS

1. The aims of the agreement are:

   a. To provide standard test procedures for assessing the reaction, if any, of munitions and weapon systems to heat fluxes which are typical of the fast heating likely to be generated within an incandescent flame envelope of a large liquid hydrocarbon fuel fire.

   b. To provide guidance on the selection between the Standard Liquid Fuel Fire Test and the Mini Fuel Fire Test.

AGREEMENT

2. Participating nations agree that the procedure incorporated in this STANAG will be used for assessing the reaction, if any, of munitions and weapon systems to heat fluxes which are typical of those likely to be generated within an incandescent flame envelope of a large liquid hydrocarbon fuel fire, and that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purpose of identification. No departure may be made from the agreement without consultation with the tasking authority. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

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DEFINITIONS

3. For the purpose of this document, the definitions of terms to be used to describe test events are provided in AOP-38, STANAG 4439, and AOP-39.

GENERAL

4. Effort to minimise the reaction of munitions to fire and to maximise the time to this reaction is a continuing commitment of weapons designers in order that the safety of personnel and materiel will not be unduly jeopardised.

5. The objective of the selected fuel fire test is the determination of the reaction and time to reaction, of the munition(s) when subjected to a liquid fuel fire environment. This document addresses the accidental exposure of munitions and weapons systems to fire afloat and ashore, which is a recurring and significant safety problem.

DETAILS OF THE AGREEMENT

6. Application. This STANAG provides guidance and procedures for fuel fire tests. They should be conducted by participating nations as a part of the Insensitive Munition (IM) evaluation of munitions where required by STANAG 4439. They may also be used for Hazard Classification (HC) as required by STANAG 4123 and UN Document ST/SG/AC.10/11/ Rev 3/R.256, and other applications not covered by these STANAGs, but where the response of a munition to fuel fire is required to be known. When intended to satisfy both IM and HC requirements, the test plans should be coordinated with appropriate authorities in these two areas. The bonfire (with wood) is not a suitable test for IM purposes because of the typically long rise time of temperature (see paragraph 13).

TEST FACILITIES:

7. This document describes a standard Liquid Fuel/External Fire Test (see Annex A).

8. An alternative Mini Fuel Fire (MFF) Test (Annex B) is provided for use when fragment mapping is not required, but pollution considerations need to be considered.

9. In the standard liquid fuel/external fire test, the test specimen is surrounded by fuel rich flames from a large open hearth containing liquid fuel (see Annex A, paragraph 1). The large horizontal dimensions of the hearth ensure that the flames are fuel rich and hence heat transfer to the test specimen is approximately 90% radiative.

10. Fuel rich flames and 90% radiative heat transfer are achieved in the MFF by placing baffles around the much smaller hearth to restrict oxygen input.

11. Where desired the MFF may be used to minimise pollution. Limitations on its use are as follows:

a. Size of test specimen. The test specimen must not be larger than 630 mm in any dimension nor exceed 50 kg in mass.

b. Anticipated response from test specimen. If it is likely that the response of the test specimen will be Type IV or V and that this response can be distinguished in a baffled enclosure from that of a Type I, II or III response (see AOP-39), then the smaller facility may be used. If this distinction is not known, or may not be possible, the standard liquid

fuel/external fire test facility should be used. Consideration should also be given to the possibility of the event causing significant damage to the MFF facility.

c. The MFF test facility does not permit accurate measurement of overpressure and fragment lethality that is essential in discriminating between the Type IV and Type V reactions, and for the purpose of HC. If data on these aspects are required, the test-item should be subjected to a standard liquid fuel/external fire test.

d. The requirements of the test range authority will also need to be taken into account.

12. Limitations. The fuel fire tests are designed only to simulate the most intense heating conditions likely to be created in a hydrocarbon fuel fire. They do not, however, simulate a particular in-service or accident scenario.

13. Special Notes. Explosive-filled test items involved in less intense fires, or exposed to lower rates of heating, may well remain quiescent for longer periods of time, but the magnitude of any resulting explosive event may be more violent than one from exposure to high heating rates, because of more explosive materials reaching hazardous temperatures while still confined in an unbreached enclosure.

14. Data obtained from this test MUST NOT be factored with respect to either temperature or time in order to derive forecasts of performance in other situations which may involve lower temperature or heat flux levels. Rates of heat flow and thermal gradients within complex assemblies can become non-linear when changes of state and / or the loss of integrity of internal structures and components occur.

15. Standard Test Item. The test item must be to the full production standard, although non-explosive sections of the item need only be geometrically and thermally representative. For all-up rounds that contain more than one major energetic component (such as rocket motors and warheads), the energetic components may be tested either individually or as an all-up round. For HC purposes, test the configuration to be hazard classified.

16. The use of simulants, dummy units or structures may result in a change in the heat flow patterns expected for the actual service item. Simulants may have different thermal properties than normal service items. Accordingly, any simulants used must exhibit closely comparable behaviour to that of the items they represent.

17. Similarly, complex electronic units should be thermally simulated only if it can be demonstrated independently that there is no possibility of the fire environment causing the unit to produce a spurious signal capable of initiating a firing circuit.

18. Development standard items may be used to effect preliminary assessments of thermal responses.

19. Where it is determined that only packaged items will be exposed to accidental liquid fuel fires in the service environments (including storage, transport and processing), tests should be conducted with the test item in the packaged configuration. If the test is (also) to be used for Hazard Classification, an agreement must be reached between HC and Safety Authorities on the number of test items, their configuration (packaged or unpackaged), and the number of tests to be performed.

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TEST REQUIREMENTS

20. The test consists of engulfing the munition in a fuel fire and recording its reaction as a function of time. The munition is suspended above the burning fuel and the test is terminated upon completion of the reaction(s) of the munition.

EVALUATION OF TEST RESULTS

21. Guidance is given in:

a. UN Document ST/SG/AC.10/11/ Rev 3/R.256Recommendation on the Transport of Dangerous Goods Manual of Tests and Criteria (UN tests 6c and 7g);

b. STANAG 4439, Policy for Introduction, Assessment and Testing for Insensitive Munitions.

c. AOP-39, Guidance on the Development, Assessment and Testing of Insensitive Munitions.

IMPLEMENTATION OF THE AGREEMENT

22. This STANAG is considered to be implemented by a nation when that nation has issued the necessary orders / instructions:

a. that all future munitions and weapon systems will be assessed / tested in accordance with this agreement;

b. to provide its NATO forces with the details in this agreement with reference to this STANAG.

23. Data developed in accordance with this STANAG shall be made available to other NATO Nations participating in a collaborative weapon development or procurement program, upon receipt of a request submitted through appropriate National channels.

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ANNEX A to
STANAG 4240
(Edition 2)
(Ratification draft 1)

SPECIFICATION FOR STANDARD LIQUID FUEL / EXTERNAL FIRE TEST

1. Guidance for the use of this Annex is given in paragraphs 7-19 of the STANAG.

2. Hearth Requirements. The hearth shall be large enough to allow at least 1m clearance on each side of the test item, and designed to provide a volume of flame which completely engulfs the test item throughout the trial.

3. Hearth. Liquid fuel is normally contained within a specifically prepared, polyethylene-lined, pan or hearth. The simplest design of pan or hearth can consist of a shallow, level pit, or a leveled area surrounded by a wall or embankment. The depth of the pit, or height of the wall or embankment, shall be sufficient to contain the required amounts of fuel and water as determined from paragraphs 5 and 6 of this Annex. The depth of the pit shall not block fragment projection.

4. Fuel. Suitable liquid hydrocarbon fuels are: JP-4, JP-5, Jet A-1, AVCAT (NATO F-34 or F-44), or commercial kerosene (Class C2 /NATO F-58).

5. Fuel Quantity. The quantity of fuel should be sufficient to maintain a fully developed fire for the specified period, which shall be 150% of the estimated time to reaction. Water (from a low pressure hose) may be added, as required, to raise the fuel level to the correct distance below the test item, but the quantity of fuel over the water must be greater than 15 mm at all times during the test to prevent boiling of the water due to radiation from the fire.

6. Calculation. As a general guide in calculating quantities of fuel, the rate of fuel surface regression due to combustion for all the required fuels and all sizes of hearth can be taken as 7mm/minute.

7. Position and Mounting of the Test Item. Unless otherwise specified by the Design or Test Authority, the test item shall be centred within the hearth area with its major axis horizontal. The lower surface of the test item should be high enough above the initial fuel surface to

a. allow full combustion below the test item;

b. not unduly increase the chance of occasional emergence of the test item from the flame envelope.

In order to ensure the test item is not positioned in a cooler, fuel-rich area of the flame, the position shall satisfy the temperature requirements of paragraph 12 of this Annex. As a guide, the initial height of the bottom of the test item above the fuel surface shall be no less than 0.3 meters at the start of the test. Note: For Hazard Classification the test item must be tested in its logistical configuration.

8. Suspension and Support of Store. The methods used to position and hold the test item within the fire hearth could have a very significant effect on its response to the fire environment. Unless otherwise specified, the test item shall be realistically supported such that when positioning as in paragraph 7 of this Annex, any sagging would represent that which would occur in an actual incident.

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ANNEX A to
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(Edition 2)
(Ratification Draft 1)

9. Support Stands. Any additional support stands or props should make only minimum line contact with the test item and must not screen it from the enveloping fire. The number of such extra supporting points must be kept to a minimum and should, where practical, be confined to positions where the casing of the test item is thickest.

10. Constraints. For test items that may become propulsive and compromise range safety, consider adequate means of constraint. Where necessary, the restraining device should not unduly screen the test item from incoming heat radiation from the flames. The Design or Test Authority must approve details of any such restraining attachments.

11. Support Tray. If required, a perforated metal tray or grid may be arranged below the test item and extending sufficiently (1m) on all sides, so that if the test item collapses, or its contents fall out, such items will be held to remain partially exposed to the fire. The design, construction and position of such a tray is at the discretion of the Design or Test Authority, but must be adequate to support the weight and impact of falling items. Preferably, the positioning of such a tray or grid prior to initiation of the fire should be about 50mm below the fuel surface so that it retains its strength and does not affect the combustion of the fuel.

12. Test (Flame) Requirements. An average flame temperature of at least 800°C, as measured by all valid thermocouples (sample rate > 0.2 Hz) at the test-item without contribution of the burning munition, will be considered a valid test. This temperature is determined by averaging the temperature from the time the flame reaches 550°C until all munition reactions are completed. Any deviation from this shall be recorded with appropriate time versus temperature data. The flame temperature shall reach 550°C in the order of 30 seconds after ignition as measured by any two of four flame thermocouples. The time (over a 30-second period) until flame temperature, as measured by the two thermocouples, reaches 550°C shall be subtracted from the time of reaction.

13. Ignition. To ensure a rapid, consistent build-up of flame area, the fuel should be ignited at the mid-point of one or more of the sides of the hearth by means of suitable remotely operated flame-producing devices fired simultaneously.

14. Flame Spread Rate. To enhance the rate of spread of the flame area, particularly in conditions of low ambient temperature, 20-30 litres of petrol (gasoline) are to be floated on the fuel at each of the ignition points. The time delay between placing of the petrol (gasoline) and ignition of the fire should be kept to a minimum to avoid excessive loss by evaporation and dispersion in the fuel. Initiation of the flame producing devices should ensure the best "all fire" probability. Suitable methods of remote ignition are:

a. A flame producing system that has been demonstrated to be effective and reliable consists of an electric igniter inserted into a small bagged powder charge.

b. A bundle of cotton waste (above 1-2 kg) is placed in the fuel at the midpoint of each side of the hearth. The petrol (gasoline) is poured over the waste, and the charge/igniter unit is place on the top of the bundles. The charges will still function even when completely soaked in petrol (gasoline) or kerosene, however do not allow rain to saturate the bundles.

15. Test Environment. Fire tests should not be conducted in the rain (which will cause heating problems), or when wind velocities in the test area (or inside wind barriers if such barriers are used) exceed 10 km/h, because this condition prevents full engulfment of the test item even when a wind barrier is used.

16. Thermal Insulation of Support and Restraining Rigs. Even substantial components of the support and restraining will lose a major portion of their strength within a few minutes of the full fire developing (components of wall thickness of 6 mm could reach 700°C within 2 min). To avoid unduly massive constructions, some form of thermal insulation should be applied to the structural members. A suitable material is a mineral wood fibre (density 80-100 kg/m^3). This is obtainable in the form of preformed sections and slabs of 25 mm thickness, which can readily be shaped as required. Glass fibre is not suitable as it melts at the temperature obtained within the fire. Where lagging is used, it must be kept dry until the last practical moment.

17. Instrumentation. To provide a consistent, remote indication of the full development of the fire, a minimum of 4 thermocouple elements are required. These thermocouples shall be mounted 40-60 mm from the surface of the test item at positions fore, aft, starboard and port along a horizontal plane through the centreline of the test-item. Data must be recorded every five-seconds or less (0.2 Hz). Additional thermocouples may be positioned at the discretion of the Trial Authority.

18. Thermocouples. Type K thermocouples (nickel-chromium/nickel-aluminium conductors), sheathed in inert hermetically sealed insulation and capable of withstanding 1200°C, have been successfully used to measure test temperatures.

19. Timing. The zero for the timing of hazardous events is the instant that any two of the temperature sensors reach 550°C. (This is an indication the test item has been enveloped by the fire.) Verification of the time and degree of envelopment can be obtained from a combination of cine-film or video, and a timing device).

20. The most satisfactory position for a camera/video is upwind of the fire on a tower.

21. Observations and Records. Unless noted as "optional," for IM and/or HC determination, the following minimum observations are to be made and records kept:

a. Test item identification (model, serial numbers, number of test items, etc.);

b. A record of events versus time, from ignition of the fuel to the end of the trial;

c. The nature of any reactions by the test item;

d. The nature and distribution of residue and debris;

e. Wind velocities and direction inside and outside the enclosure before the trial, and any significant change in velocity/direction outside the enclosure (preferably well clear of the enclosure) during the trial;

f. Type of fuel for the test;

g. Thermocouple identification and locations;

h. Listing of environmental preconditioning test performed;

i. Type of energetic material and weight;

j. The geographic orientation of the test item's longitudinal axis;

k. Thermocouple data (versus time) for all sensors;

l. Indication of propulsion (video or other suitable means);

m. The temperatures at the recording points need to be continuously recorded. For the purpose of the test, simple direct-indicating meters are sufficient;

n. A microphone or other suitable listening device should be placed near the trial site to record audible events. The audio record shall be a sound track on the motion picture film, or on the videotape to enable correlation with visible events and indicated time;

o. Suitable blast or pressure gauges should be positioned around the test item;

p. Thermal flux measurements; (Optional for all but candidate HD 1.3 and 1.4 articles.)

q. Fragment recovery and mapping;

s. Witness screens as a measure of severity (optional).

22. The following photographic records and videos are to be made:

a. Still photographs of the test item before and after each trial;
b. Still photographs of any other residues arising as a result of the trial;
c. Colour cine-film or video for the duration of each trial.

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ANNEX B to
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(Edition 2)
(Ratification draft 1)

SPECIFICATION FOR A MINI FUEL FIRE TEST

1. Guidance for the use of this Annex is given in paragraphs 7-11 of the STANAG.

SPECIFICATION

2. The definitive drawing for the hearth, shown schematically in Figure 1, is UK P&EE(S) Drawing No 1 –RS-0034 Issue C entitled, "Mini Fuel Fire Mk2"; extracts are at Figures 2 and 3.

3. Hearth. The hearth consists of a 2m x 2m x 0.4m (deep) tank in 10 mm mild steel, and 4 removable wings loosely fitted to the tank by square hollow section steel posts in sockets at each corner. The 0.5 m vertical section of each wing above the lip of the tank is of heavy gauge expanded steel, as specified in Figure 4, framed in box section mild steel. Above this is a further 0.75m of 8mm mild steel plate, similarly framed but inclined inwards at 30° to the vertical, so as to form part of a short smokestack and downwards-facing black body radiator. The expanded steel section creates the air/fuel ratio necessary for fuel rich, soot-producing combustion.

4. Test Item Limitations. Physically the test item shall not exceed 630 mm in any dimension and shall not weigh more than 50 kg. Because there are no cost advantages in using the Mini Fuel Fire if the hearth were to be damaged severely as a consequence of the test, its use should be limited to stores predetermined as being unlikely to explode or detonate in the test, or whose Net Explosive Quantity is no more than would render acceptable minimal hearth damage after cook-off.

5. Positioning of Store. The store is to be placed symmetrically within the hearth with its major axis horizontal, such that its lower face is 375 - 425 mm above the initial fuel surface, unless otherwise specified.

6. Support Stand. The store is to be supported on a stand, which is sufficiently robust to prevent sagging or premature collapse. The stand is to make contact with the store in a way representative of a real incident, and must not screen the store from the surrounding fire. The number of additional supporting points must be kept to a minimum consistent with adequacy of support and should, wherever possible, be confined to the area of the store where the casing is thickest. An open mesh table in the same material as the lower wings appears suitable for most applications.

7. Restraints. Adequate means of constraint shall be provided to prevent stores that contain propellant from being displaced from the test position. Wherever practical, restraints should be confined to the thickest parts of the store casing and should not screen the store from incident radiation unduly.

8. Fuel. The liquid hydrocarbon fuel is to be AVCAT (NATO F-34 or F-35) or commercial kerosene Class C2 (NATO F-58) of sufficient quantity to cause a reaction of the store under test. An approximate burning rate of 5 mm depth / min has been established for this hearth.

9. Wind Limitations. To prevent local wind disturbances that could affect the fire symmetry, the ground surrounding the test site is to be reasonably flat and level. Trees, hedges or buildings must not be closer to the hearth than 20 times their height and, ideally, not closer than 30 times their height. Trials should not be attempted in prevailing wind speeds exceeding 10 km/h (5.5 knots), either steady or gusting. Additionally, if the wind speed in the centre of the hearth exceeds 5 km/h (2.8 knots), a steel windshield is to be placed upwind

against the hearth at an angle of 70° to the vertical. It is to be of 1.6 mm gauge, 1.8 m x 0.9 m, with the longest edge on the ground.

INSTRUMENTATION

10. Pressure Gauges. A suitable blast or pressure gauge is to be placed at the same height and 5 m from the centre of the store.

11. Thermocouple System. Four thermocouples are to be placed such that their junctions are at the same height as the centre of the store, and offset 40 – 60mm from each side. Remote indication of satisfactory full development of the fire is when any two of these thermocouples reach 550°C (time zero for measuring reaction time) within 30 seconds of ignition, and/or either the store has reacted or the arithmetic mean temperature of the four thermocouples reaches 800°C within two minutes. Verification of reaction time and satisfactory development of the fire can be taken from CCTV records. Additionally:

a. Further thermocouples may be positioned at the discretion of the trial authority.

b. Type K thermocouples (nickel-chromium/nickel-aluminium conductors), sheathed in inert hermetically sealed insulation, and capable of withstanding 1200°C, have been success fully used to measure data.

c. The connections between the thermocouples and extension cable or interface unit must be made at least 5 m from the hearth, and on the upwind or crosswind sides. Extension cables may be of plastic covered copper.

d. The temperatures of the thermocouples need to be monitored continuously. Simple direct indicating meters are sufficient for the purpose of this test. Automatic recording equipment should have a sampling rate of not less than once per second.

e. Sand filled bags have been found to give satisfactory protection to thermocouple cabling against ballistic fragments and heat resulting from the test. The Mini Fuel Fire hearth and wings in themselves offer considerable protection.

12. CCTV and Microphone. The most satisfactory position for a CCTV camera is at ground level, on a crosswind side, 15 m from the fire. The line of sight to the store is therefore inclined slightly upwards and through the expanded metal mesh of a wing. A single microphone, incorporated into the CCTV recording system, is to be placed near the store.

TEST ITEM STANDARD

13. For formal purposes the explosive store tested must be to the full production standard. However, the non-explosive sections may be replaced by thermal and geometric representations, provided they exhibit closely comparable behaviour throughout the test to the production standard non-explosive items.

14. Complex electronic units may be thermally simulated, but only if it can be demonstrated that there is no possibility of production of a spurious pulse capable of initiating a firing circuit.

15. Development standard items may be used for preliminary assessment of thermal responses.

16. Where it is assessed that only packaged items will be exposed to liquid fuel fire in the service environments (including storage, transport and processing), the tests should be conducted in the packaged configuration.

IGNITION

17. To ensure a rapid consistent build-up of the flame area, the fuel is to be ignited at diagonally opposite corners of the tank by means of two suitable remotely operated pyrotechnic devices fired simultaneously.

18. To enhance the rate of spread of the flame area, particularly in conditions of low ambient temperature, up to 10 litres of petrol (gasoline) may be floated on the fuel at each ignition point.

19. A flame producing system, which has been shown to be effective and reliable, consists of an electrically initiated igniter inserted into a small-bagged powder charge. Suitable military devices are:

a. Igniter S/F, Electric (ADAC No 51204-01);

b. Simulator shell burst (ADAC No 23502-04). Charge, bagged, 2 oz G12, No MK 2;

c. Simulator shell burst (ADAC No 23072-04). Charge, bagged, 4 oz NRN, No 12 MK 1.

20. A bundle of cotton waste (1-2kg), in which the charge/igniter unit has been folded into the top, is partially immersed in the fuel at both ignition points and the petrol (gasoline) is gently poured **over** the waste and charge/igniter units. The charges will function even when completely soaked in petrol (gasoline) although not so reliably when soaked with kerosene or AVCAT.

OBSERVATIONS AND RECORDS

21. The following minimum observations are to be made and records kept:

a. Test item identification (model, serial numbers, number of test items, etc.);

b. A record of events versus time from ignition of the fuel to the end of the trial;

c. The nature of any reactions by the test item;

d. The nature and distribution of residue and debris;

e. Wind velocities and direction inside and outside the enclosure before the trial, and any significant change in velocity/direction outside the enclosure (preferably well clear of the enclosure) during the trial;

f. Type of fuel for the test;

g. Thermocouple identification and locations;

h. Listing of environmental preconditioning test performed;

i. Type of energetic material and weight;

j. The geographic orientation of the test-item's longitudinal axis;

k. Audio record (in combination with high-speed video recording);

l. Thermocouple data (versus time) for all sensors;

m. Indication of propulsion (video or other suitable means).

22. The following photographic records and videos are to be made:

a. Still photographs of the test item before and after each trial;

b. Still photographs of any other residues arising as a result of the trial;

c. Colour cine-film or video for the duration of each trial.

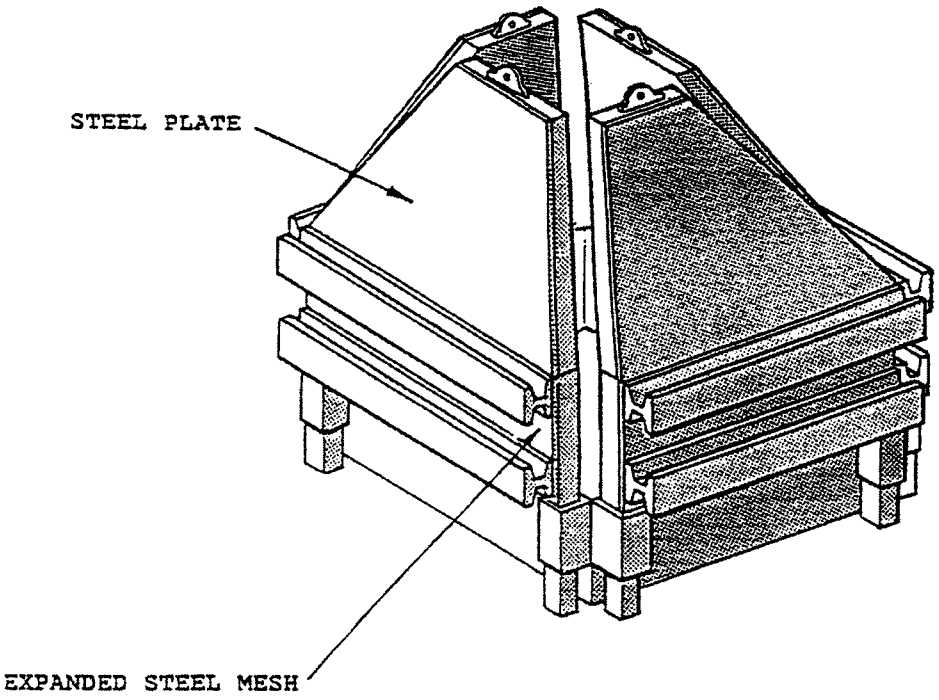


Figure 1a. General Arrangement (Schematic)

Enclosure to
AC/310-D/198

ANNEX B to
STANAG 4240
(Edition 2)
(Ratification Draft 1)

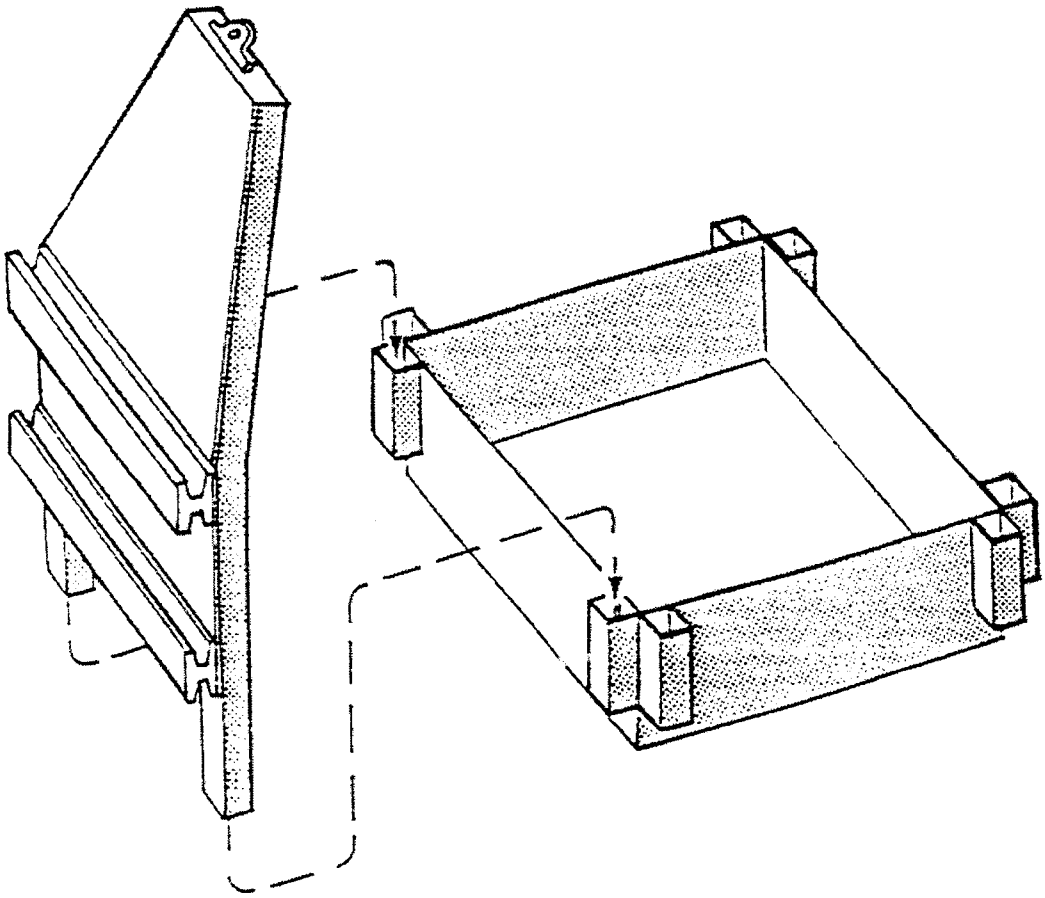
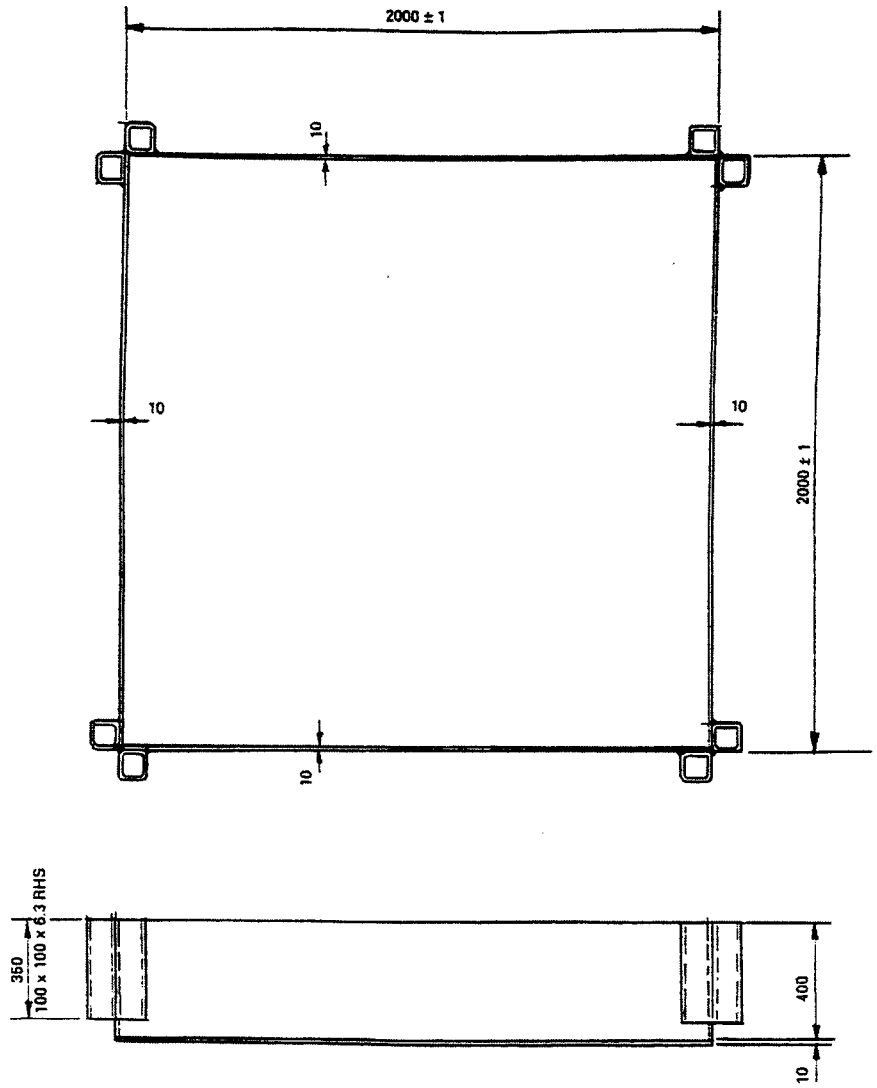


Figure 1 - GENERAL ARRANGEMENT
(Schematic)



BASE TRAY

MATL:-10MM THK M.S. PLATE & 100 x 100 x 6.2 RHS

NOTE 1. ALL DIMENSIONS IN MM

2. FULLY WELDED CONSTRUCTION
WELDING PROCEDURE TO BS 5235
MMA ELECTRODES TO BS 635

Figure 2 - SPECIFICATION FOR A HEARTH TANK
(Not to scale)

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(Ratification Draft 1)

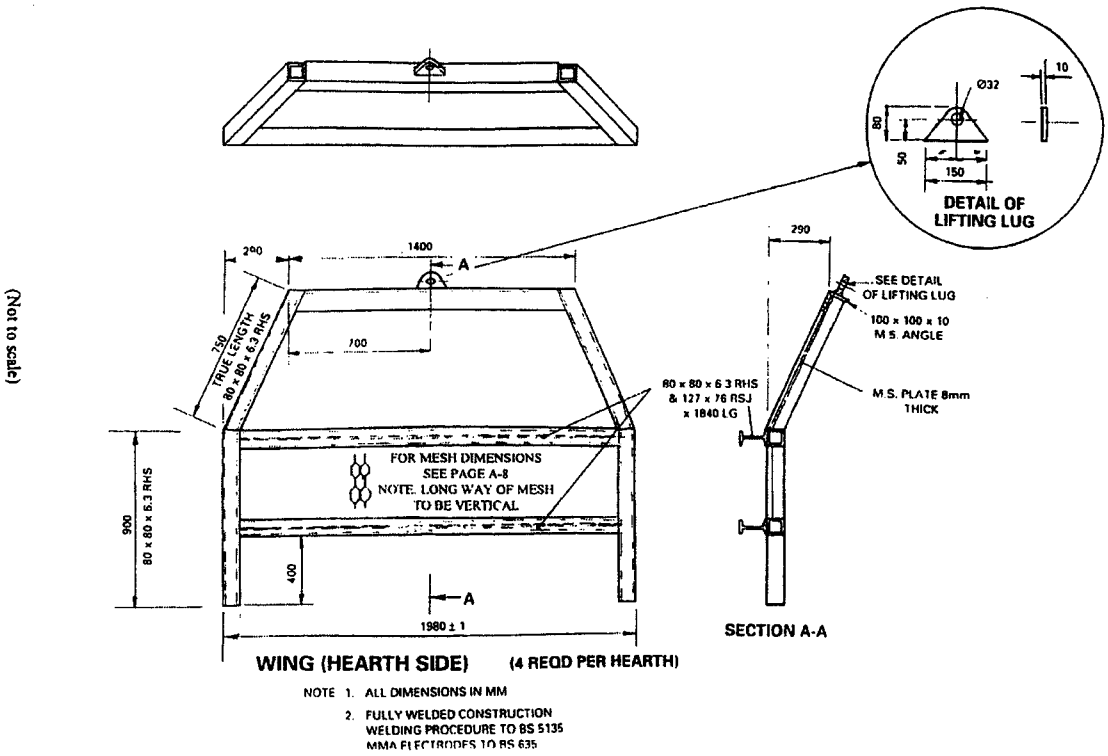
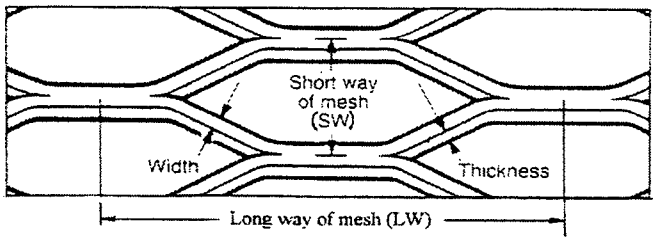


Figure 3. Specification For A Hearth Wing.

SPECIFICATION FOR A HEARTH WING - MESH SIZE



Material Type	Nominal Size of Aperture mm		Nominal overall thickness mm		Approx weight uncoated kg/m²
	LW	SW	Width	Thickness	
Carbon Steel	70	16	13	6.5	34

Figure 4. Specification For A Hearth Wing-Mesh Size.

ANNEXE au
AC/310- D/198

STANAG 4240
(Edition 2)
(Projet de ratification 1)

REPONSES DES PAYS CONCERNANT LA RATIFICATION ET LA MISE EN APPLICATION D'UN STANAG

(Référence nationale et date)

Au: Secrétaire général adjoint pour le Soutien de la défense,
OTAN, 1110 Bruxelles, Belgique

Objet: STANAG 4240 (Edition 2) - PROJET DE RATIFICATION 1 – INCENDIE DE CARBURANT LIQUIDE / INCENDIE EXTERNE, PROCEDURES D'ESSAI DES MUNITIONS

Référence: AC/310-D/193, daté du 12 décembre 2001

1. *(pays)* ratifie/ne ratifie pas(*) l'accord diffusé sous couvert du document cité en référence.

2. La référence de la ratification et les dates de mise en application sont les suivantes:

Référence et date de la ratification	Date envisagée de mise en application		
	MER	TERRE	AIR

3. DOCUMENT(S) NATIONAUX DE MISE EN APPLICATION:

4. RESERVES

5. AUTRES RENSEIGNEMENTS:

.....
(Signature)